Barbados Oceanics Eocene Provenance: Pelagic, Volcanic, Impact, and "Sahara" Dust?

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Abstract

The Eocence Barbados Oceanics have been recognised as a classic pelagic sequence since the early works of Senn and others. Proximity to the arc(s) at the leading edge of the Caribbean plate and occasional ash beds in the Oceanics obviates a volcanic influence as well. In the 1980s a major discovery was made that linked a thin but distinctive microtektite horizon in the Oceanics as a layer of 35.5±0.3 Ma distal ejecta to the Chesapeake Bay impact crater. Microkrystites postulated to be distal ejecta from the 35.7±0.2 Ma Popagi crater in Russia may also be present. We measured sections and collected samples from the Oceanics outcrops at Gays Cove and Bath Cliffs with the aim of re-collecting and further studying the microtektite layer. We also obtained and used a suite of previously collected samples, including that from the microtektite layer, from Prof. Anika Sanfillipo. We disaggregated and processed all samples into separates of pelagic fossils, common accessory minerals, microtektites, and heavy minerals. We present our new biostratigraphic analysis, together with a preliminary detrital zircon U-Pb analysis of the heavies. We recognize volcanic ash-fall zircons that give the precise Eocene depositional ages throughout the Oceanics sedimentary rock column and provide new links between the biostratigraphic and absolute time scales, together with a less frequent, much older, population of Paleozoic-Proterozoic detrital zircons. The puzzle of how to get such old zircon grains into a pelagic setting, with absolutely no evidence for a South American clastic influence, can be solved if we call on an easterly Eocene "Sahara" dust source from exposed pan-African bedrock, when Africa would have been 700 km closer to proto-Barbados than it is today. A future extension of this work could be to date very small zircon grains from large volcanic and/or other instantaneous sources (e.g. impacts) that get distributed globally via the stratosphere; this might render many "ordinary" sedimentary deposits datable via U-Pb geochronology.